AMENDMENT TO THE DRAWINGS

Please amend Figs. 1 and 2 as shown in redline on the attached marked-up drawing sheet.

REMARKS

Claims 1-19, 23-25, and 29-39 are present for the Examiner's review and consideration. Claims 1, 2, 4, 6, 8, 15, 17, and 23-25 are currently amended, and claims 29-39 are newly added. Claims 20-22, and 26-28 (the latter two being duplicate claims 25 and 26 that were renumbered by the Examiner) are cancelled without prejudice.

The specification has been amended in the paragraph beginning on page 24, line 10 to remove the numeral "8," which numeral is not included in the drawings. Figs. 1 and 2 have been amended to include the designation "Prior Art," as proposed by the Examiner. Applicants respectfully maintain that Fig. 3 does not require a similar "Prior Art" designation because Fig. 3 shows a donor wafer after a first recycling step according to the present invention, as explained, for example, in the paragraph beginning on page 11, line 28 of the specification.

In response to the Examiner's objections to the claims, claim 1 has been amended to change the recitation of "a useful layer" to "a new useful layer," as proposed by the Examiner. As such, claim 1 is believed to be free of informalities, and Applicants respectfully request that the Examiner's objections be withdrawn.

Claim 1 has been amended to recite that the buffer structure includes a buffer layer having a first side with first crystalline properties, for association with the substrate, and a second side with second crystalline properties that are different from the first crystalline properties, for association with the useful layer, and a portion transitioning between the first and second properties. Claim 1, as amended, also recites that the method comprises mechanically removing at least part of the remaining portion of the useful layer while preserving the buffer layer. No new matter has been added as a result of these amendments, and the amendments are fully supported in the originally filed specification claims, and drawings. Claims 1, 2, 4, 6, 8, 15, 17, and 23-25 have also been amended to more particularly recite the invention under 35 U.S.C. §112, second paragraph. New claims 29-39 have also been added and are fully supported in the originally filed specification.

Applicants appreciate the Examiner's indication of allowable subject matter in claims 23-26. Claim 23 has been rewritten in independent form as a method claim to include the recitations of the base claim and intervening claims. Additionally, claim 23 has been written to refer to the overlayer as not contained within the buffer structure for consistency with the specification. Claim 26 has been combined with claim 25. As such, claim 23, and claims 24-25 that depend therefrom, are believed to be in condition for allowance.

Claim 1-9, 14-22, and 27-28 were rejected under 35 U.S.C. § 102(b) as anticipated by Kakizaki. Claim 1, as amended, is directed to a method of recycling a donor wafer after detachment of a useful layer of semiconductor material therefrom. After detachment of the useful layer, the donor wafer includes a substrate, a buffer structure on the substrate, and a remaining portion of the useful layer. The buffer structure includes a buffer layer that has a first side with first crystalline properties, for association with the substrate, and a second side with second crystalline properties that are different from the first crystalline properties, for association with the useful layer, and a portion transitioning between the first and second properties. The recycling method comprises mechanically removing at least part of the remaining portion of the useful layer while preserving the buffer layer in order to provide a donor wafer surface that is suitable for use in a subsequent detachment of a new useful layer.

Kakizaki, on the other hand, is directed to a process for producing a semiconductor article that includes growing an epitaxial growth layer 12, a porous layer 13, a semiconductor layer 14, and an insulating layer 15 on a substrate 11, and bonding a second substrate 16 and insulating layer 17 thereto. After dividing the bonded structure, the residual porous body 13B is selectively removed and the epitaxial growth layer 12 is flattened and smoothed such that it can be used again in the process. (Kakizaki 5:18-9:7; Figs. 1A-1K). Epitaxial growth layer 12 is not a layer that is intended to be preserved, but instead is intended to be consumed piecemeal, as explained below.

Kakizaki does not teach or suggest each and every element of claim 1, and thus cannot anticipate claim 1 and does not render it obvious. Claim 1 recites a buffer layer that has a first side with first crystalline properties and a second side with second crystalline properties that are different from the first crystalline properties, and a portion transitioning between the first and second properties. Advantageously, the buffer layer acts as a transition layer between the substrate and the useful layer, and makes it possible to obtain on the donor wafer a useful layer that has, for example, a substantially different lattice structure from that of the substrate. The buffer layer enables the useful layer to be associated with the substrate having significantly different crystalline properties.

Kakizaki does not teach the use of a buffer layer when producing the semiconductor article. Rather, Kakizaki merely discloses the use of an epitaxial growth layer 12 that is grown on the surface of the substrate 11. Moreover, it would not have been obvious to one of ordinary skill in the art that such a growth layer 12 could have a first side with first crystalline properties, for association with the substrate, and a second side with

second crystalline properties that are different from the first crystalline properties, for association with the useful layer, and a portion transitioning between the first and second properties to accommodate attachment to both a substrate and a useful layer having a substantially different lattice structure than that of the substrate. Kakizaki does not teach a buffer layer like that of claim 1, and thus, claim 1 is not anticipated by Kakizaki.

Kakizaki also does not teach preserving any buffer layer as is recited in claim 1. A buffer layer as claimed is difficult and expensive to produce, and the present invention provides the surprising advantage by preserving the buffer layer in condition to be reused in the manufacturing process, which very significantly reduces costs and manufacturing complexities. In the past, at least part of the buffer layer was destroyed in the process and had to be reformed.

In Kakizaki, however, the epitaxial growth layer 12 that the Examiner proposes is a buffer structure is in fact consumed during repeated steps of the Kakizaki process. As shown in Figs. 1I and 1J, the surface of the epitaxial growth layer 12 is rough after removal of the residual porous body 13B, and the layer 12 is subjected to a heat treatment to flatten and smooth the surface thereof so that the epitaxial growth layer 12 may again be used with the substrate for transferring a layer in repeated process steps (Kakizaki 8:64-9:10). The epitaxial growth layer 12 is simply present on the substrate 11 to support the porous layer 13 thereon, and there is not motivation to preserve such a layer 12. Furthermore, because the epitaxial growth layer 12 is intended to be consumed, as opposed to preserved, Kakizaki teaches away from claim 1. As such, Kakizaki does not teach or suggest all the elements of claim 1.

Amended claim 23 and new claim 35, and those claims that depend therefrom, recite similar features of preserving a buffer layer as does claim 1. Therefore, these claims also are neither anticipated, nor rendered obvious, by Kakizaki.

In particular, new claim 29 recites a method where the first crystalline properties comprise a first lattice parameter, and the second crystalline properties comprise a second lattice parameter to enable the useful layer to be associated with the substrate via the buffer layer. Also, new claim 30 recites a method where the substrate has a lattice parameter that is different from the lattice parameter of the useful layer. New claims 35 and 36 also teach a buffer layer that matches the lattice parameters of the substrate and useful layer. These claims are neither anticipated nor suggested by Kakizaki because nothing in Kakizaki teaches a buffer layer that accommodates attachment to other layers or substrates having different lattice parameters. Moreover, because Kakizaki does not teach a buffer layer that

can attach to a substrate and useful layer having different lattice parameters, the Kakizaki process would not be able to produce semiconductor articles that include some of the materials recited, for example, in claims 10, 12, and 14, such as SiGe, AsGa, or InP.

Claim 17, as amended, recites that the zone of weakness is formed by implantation of atomic species through the useful layer. Kakizaki, however, forms its porous layer 13 on the surface of the epitaxial growth layer 12 prior to adding the semiconductor layer 14. New claim 34 recites one embodiment of the invention where the buffer structure is reformed prior to the addition of a new useful layer thereon. As previously discussed, Kakizaki teaches simply removing successive portions from the epitaxial growth layer 12 until the layer is exhausted. For at least these reasons, these claims are also not anticipated, or rendered obvious by, Kakizaki and are patentable on their own merit.

In view of the foregoing, applicants believe that the entire application is now in condition for allowance, early notice of which would be appreciated. Should the Examiner not agree, then a personal or telephonic interview is respectfully requested to discuss any remaining issues in an effort to expedite the allowance of this application.

Respectfully submitted,

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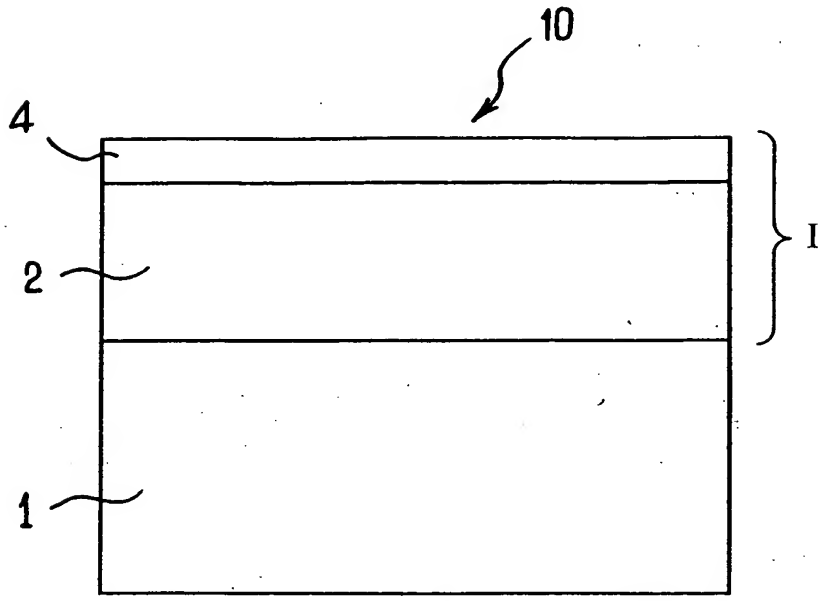

FIG.1 (Prior Art)

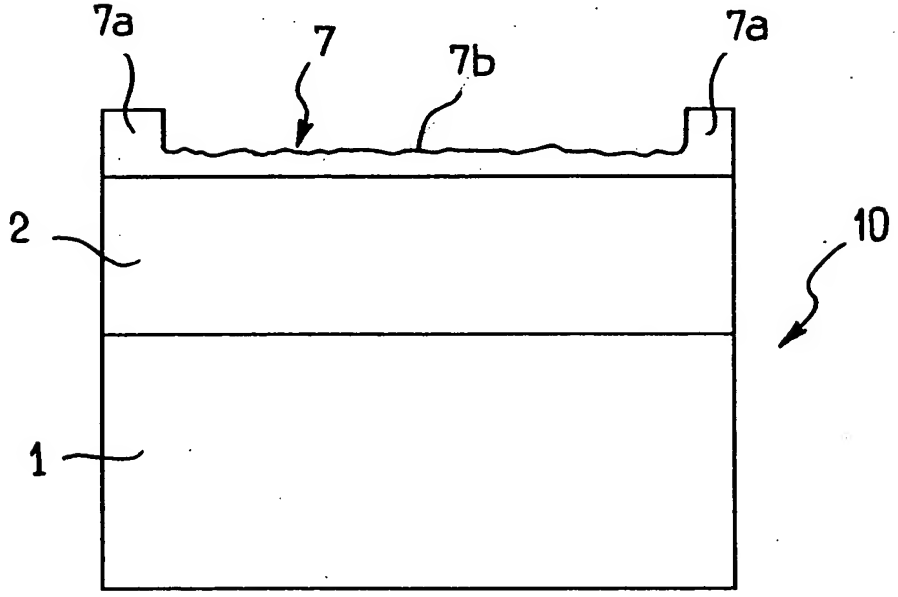

FIG.2 (Prior Art)